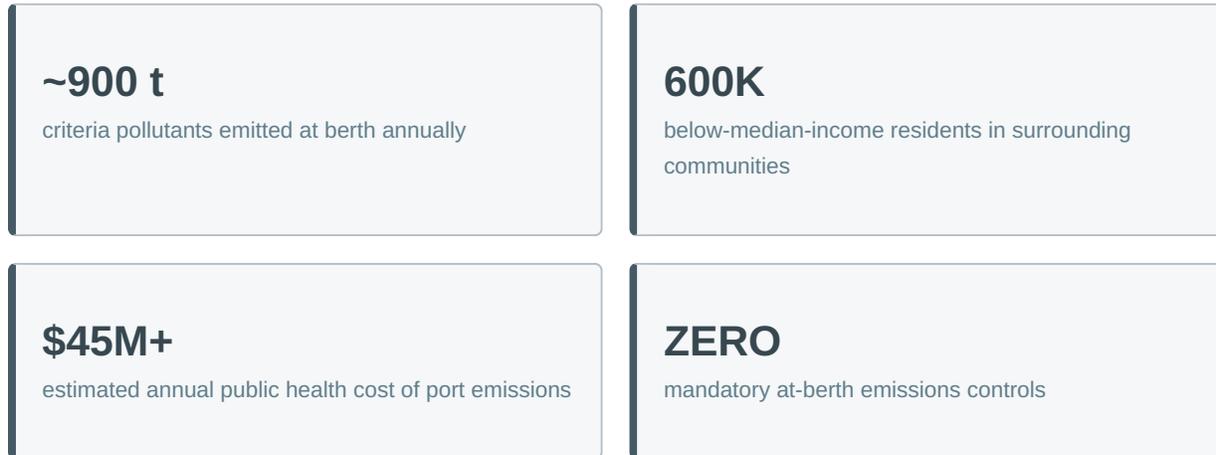


Port of Seattle / Tacoma

The Pacific Northwest's Hidden Health Cost



Sources: ICCT Port Emissions Screening (2024); ICCT Electrifying Ports Study (2023); EPA BenMAP methodology; U.S. Census ACS

Port Overview

The Northwest Seaport Alliance (NWSA) operates marine cargo facilities at the Ports of Seattle and Tacoma, making it the fourth-largest container gateway in North America. The port complex handles container ships, cruise vessels, bulk carriers, and break-bulk cargo across terminals on Elliott Bay and Commencement Bay. Approximately 4,000 heavy-duty diesel trucks make frequent trips between the port and inland destinations, concentrating air pollution in the Duwamish Valley and port-adjacent communities.

The ICCT classifies the Seattle port group as a Priority 2 port complex for health impact intervention. The ICCT's 2023 electrification study provides the most detailed published emissions baseline and health impact modeling for any U.S. port outside of New York/New Jersey, making Seattle a critical test case for at-berth emissions policy.¹

Who Is Affected

Port facilities in Seattle are concentrated along the Duwamish River valley — a federal Superfund site surrounded by environmental justice communities that already face cumulative contamination from over 100 hazardous waste sites. Three freeways and two rail lines bisect the valley, which lies within the flight path of two airports.

Community	Population	Key Health Burden
South Park	4,000+	4x asthma hospitalization rate vs. King County; 40% Latino population
Georgetown	2,000+	Life expectancy 73 years vs. 82 citywide; highest cumulative pollution burden
Duwamish Valley / Beacon Hill	30,000+	PM2.5 hotspot from port truck idling contributing 55% of local NOx
Tacoma Tideflats	15,000+	Adjacent to container and bulk terminals on Commencement Bay
White Center	15,000+	Unincorporated community; elevated environmental justice indicators

Environmental Justice

The Duwamish Valley population is over 70% people of color, 42% foreign-born, and 40% Latino. Residents of ZIP code 98108 are nearly four times more likely to be hospitalized for asthma than King County residents overall. Georgetown and South Park residents face life expectancies 13 years shorter than Seattle's wealthiest neighborhoods — a disparity driven by cumulative environmental pollutant exposure. The EPA has designated both neighborhoods as "environmental justice" communities.²

Health Impact Analysis

Using the ICCT's goPEIT emissions inventory and InMAP dispersion modeling from the 2023 electrification study, combined with EPA's concentration-response methodology, we model the health outcomes attributable to at-berth vessel emissions and the benefits of their reduction.

The scenario below models outcomes using the performance of currently deployed, CARB-certified barge-mounted capture systems (99% PM2.5, 95% NOx removal — independently verified by Yorke Engineering LLC).

Health Outcome	Current Annual Burden	With At-Berth Capture
PM2.5 emissions at port (tonnes/yr)	~200 t	69–99% reduction
NOx emissions at port (tonnes/yr)	~500 t	Up to 95% reduction
Premature deaths from port PM2.5	Estimated 8–20/year	5–19 lives saved/year
Cardiovascular & respiratory hospitalizations	Estimated 30–80/year	20–75 avoided/year
Childhood asthma ED visits	Estimated 45–120/year	30–115 avoided/year
Monetized public health benefit (EPA VSL)	\$45M+/year	\$30–\$50M saved/year

Methodology Note

Premature death estimates use EPA's concentration-response function for PM2.5 (Krewski et al. 2009, ACS CPS-II) and EPA Value of Statistical Life (\$11.8M, 2024-adjusted). The ICCT's 2023 electrification study found that full electrification at the Port of Seattle would reduce PM2.5 by 75% and avoid approximately 3 premature deaths per year, representing \$27M+ in health benefits. Our at-berth capture scenario extends this analysis by modeling additional reductions from CARB-certified capture technology. Ranges reflect uncertainty in dispersion modeling and exposure assumptions. All estimates are conservative — they exclude SOx and secondary PM2.5 formation, which would increase totals.

The Duwamish Impact

The Duwamish River valley is one of the most striking examples of environmental injustice in the Pacific Northwest. The Lower Duwamish Waterway is a federal Superfund site, contaminated by decades of industrial activity. Port operations add an additional layer of air pollution to communities already dealing with soil and water contamination.

The ICCT's 2023 study found that full electrification at the Port of Seattle would reduce the total area affected by port emissions from 292 km² to just 55 km² — an 81% reduction in the

geographic footprint of port pollution. The annual average PM_{2.5} concentration near the port would drop by 0.3–0.42 µg/m³, a considerable amount given Seattle's annual average PM_{2.5} concentration of 7.5 µg/m³ in 2019.¹

Of all electrification technologies modeled, electrifying harbor craft alone could reduce PM_{2.5} by 45%. But the greatest community health gains come from eliminating at-berth emissions from ocean-going vessels — emissions that barge-mounted capture systems can reduce by 99% for PM_{2.5} and 95% for NO_x using technology deployed in California today.

The Regulatory Gap

Washington state has adopted California vehicle emission standards under Section 177 of the Clean Air Act for mobile sources, establishing a clear precedent for adopting CARB regulations. In October 2023, the EPA authorized states to adopt California's At-Berth Regulation. **Washington has not adopted at-berth vessel controls, despite having the strongest existing regulatory precedent of any non-California state.**

Terminal 5 in Seattle became shore power-capable in 2023, and the NWSA completed shore power at the Husky Terminal in Tacoma. These investments represent important progress, but voluntary shore power adoption without regulatory mandates leaves the majority of at-berth emissions uncontrolled — and does nothing for vessel types that cannot use shore power.

Pathways to Action

Several pathways exist for reducing at-berth emissions at the Seattle/Tacoma port complex:

- **State adoption of CARB-equivalent regulation:** Washington's existing Section 177 adoption of CARB vehicle standards creates the strongest precedent of any non-California state for adopting at-berth controls
- **NWSA voluntary commitment:** The Northwest Seaport Alliance could require at-berth controls as a condition of terminal leases — building on its Duwamish Valley Community Benefits Commitment (Resolution 3767)
- **Washington Department of Ecology rulemaking:** State environmental agency action under existing air quality authority
- **Carbon credit incentives:** Voluntary carbon market frameworks currently under development could provide revenue to fund capture deployment without regulatory mandates
- **Federal EPA Clean Ports funding:** The \$3 billion Clean Ports Program (IRA Section 60102) — disbursement status under current administration requires FOIA verification

What Comes Next

This assessment is a screening-level analysis using publicly available data, anchored by the ICCT's 2023 electrification study baseline. A full site-specific assessment for the Seattle/Tacoma port complex — with higher-resolution dispersion modeling, localized health data, and census-tract-level environmental justice analysis — is available through our [research services](#).

Port Health Watch is also developing:

- **Air Quality Health Units (AQHUs):** The first tradable health benefit asset class for port pollution reduction, under development for submission to Verra's SD VSta program. [Learn more →](#)
- **Carbon credit methodology:** A Verra VCS methodology for at-berth maritime carbon capture, targeting July 2026 submission. [Learn more →](#)

The Opportunity

At-berth emissions capture at the Ports of Seattle and Tacoma could save 5–19 lives per year, prevent dozens of hospitalizations and emergency room visits, and deliver \$30–\$50 million annually in monetizable health benefits — using technology that is commercially deployed and independently verified today. Washington state's existing adoption of CARB vehicle standards makes it the most actionable jurisdiction in the country for at-berth regulation outside California.

1. ICCT, "Electrifying ports to reduce diesel pollution from ships and trucks and benefit public health: Case studies of the Port of Seattle and the Port of New York and New Jersey" (February 2023). [↔↔](#)
2. University of Washington EDGE Center, Duwamish Valley Research; King County Public Health; Duwamish River Community Coalition; U.S. Census ACS 5-year estimates. [↔](#)

This assessment was produced by Port Health Watch, a research initiative of Civil Ledger Lab, operated by EcoAsset Lab LLC. For site-specific assessments with higher-resolution modeling, contact research@porthealthwatch.org.